PATENT SPECIFICATION

758,090

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COMPLETE SPECIFICATION

Improvements in and relating to Devices including an Inflatable balloon.

We, SUCAL LIMITED, a British Company, of 62-64 Temple Chambers, Temple Avenue, London, E.C.4, CHARLES THEODOR SUCHY, a British subject, of "Austerlands," Kingston Hill, Kingston, Surrey, DAVID JOHN MCAULEY, a British subject, of 20 Upper Park Road, London, N.W.3, and HAYDN JOHN FERRER, a British subject, of 2A Halsbury Road East, Northolt Park, Middlesex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to devices including an inflatable balloon.

In accordance with the invention there is provided a device which includes an inflatable balloon having arranged within its interior a radio aerial comprising at least one non-rigid electrically conductive member which upon inflation of the balloon assumes and maintains its predetermined dimensions and disposition.

The invention also provides a device including an inflatable balloon having supported within its interior a radio aerial comprising at least one limp electrically conductive member, inflation of the balloon causing the electrically conductive member to assume and maintain the predetermined dimensions and disposition of the radio aerial.

Further the invention provides a device including an inflatable balloon contained within an outer covering, and having an electrically conductive member or a system of electrically conductive members arranged within its interior whereby when the balloon is inflated the electrically conductive member or the system of electrically conductive members assumes and maintains the predetermined dimensions and disposition of a radio aerial.

Still further the invention provides a device including an inner inflatable balloon contained within an outer inflatable balloon, the inner balloon having an electrically conductive member or a system of electrically conductive members arranged within its interior whereby when the inner balloon is inflated the electrically conductive member or the system of electrically conductive members is caused to assume and maintain the predetermined dimensions and disposition of a radio aerial, means also being provided to maintain the inner balloon approximately at a predetermined size under varying atmospheric conditions.

The term "radio aerial" used in this specification and claims is to be understood as meaning one or a system of more than one electrically conductive member the dimensions and disposition of which have to be arranged and maintained within predetermined limits.

The balloon being of thin flexible material can be inflated so that it imparts sufficient tension to the radio aerial within it so that the latter assumes and maintains its predetermined dimensions and disposition.

Other features and advantages of the invention will be apparent from the following description of one particular embodiment thereof, given by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a sectional view of a balloon assembly.

Figure 2 is a view of an inner balloon provided with a parachute.

The balloon assembly shown in Figure 1 includes a radar reflector, within a balloon which is adapted to be inflated with gas and released for free flight, and to be tracked by a radar apparatus for meteorological purposes. This assembly includes an outer balloon 1 of thin rubber, and similar to that normally used for this purpose, and an inner balloon 2, also inflatable with gas, but of somewhat thicker rubber. Within the inner balloon 2 is secured a radio aerial which is a radar "corner" reflector 3; the reflector is formed of thin metallised fabric, such as open-mesh nylon material metallised by the process of

British patent No. 572,071. The reflector has six apices, four of which are indicated by the reference 4. The reflector is secured to the inner surface of the inner balloon 2 at each of its six apices, so that when the balloon is inflated to the correct size the reflector presents eight reflecting "corners."

For satisfactory operation as a reflector, the reflector 3 has to be made of material which is only very slightly and preferably negligibly extensible; if the inner balloon 2 were caused to expand very much beyond the optimum size for supporting the reflector 3, as would be the case if the inner balloon 2 were allowed to ascend freely, it would be seriously distorted and would soon burst.

To prevent this, a valve is provided for controlling the pressure differential on the skin of the inner balloon. This valve is formed by a hard rubber tube 5, constituting the neck of the inner balloon 2 and having in it two holes 6 covered by a rubber sleeve 7 fitting on the tube 5. The elasticity of the sleeve 7 is normally sufficient to keep the holes 6 covered against the gas pressure within the balloon. Two tapes 8 are attached at 9 to the surface of the balloon 2, at approximately opposed points on the horizontal midplane of said balloon and these tapes 8 are attached to the rubber sleeve 7, at 10 near the holes over which the sleeve lies. In this way, when the inner balloon 2 expands the tapes 8 pull the sleeve 7 away from the holes 6 and permit gas to pass from within the inner balloon 2 to the space between the balloons 1 and 2.

The neck of the outer balloon 1 is secured at 11 to the outside of the hard rubber tube 5, below the valve formed therein. The tube 5 can then form a common filling nozzle for both balloons. The filling connection on the tube 5 is not shown.

If desired a parachute can be attached to the outside of the inner balloon, to prevent the parts, after both balloons have burst, from falling too rapidly and possibly causing injury. As will be seen from Figure 2 the parachute 12 fits closely upon the upper half of the inner balloon 2, and the tapes 8, with others such as 13, can form the shroud lines of the parachute 12.

In some circumstances it may be required to provide a radio aerial such as a radar reflector which is elevated above the ground or the sea. For this purpose a single tethered balloon, which may be without the valve, may be used as the balloon will not be subject to excessive expansion. Further if the balloon is arranged so that it will not rise into the air it can be used to provide a radio aerial which will for example float upon the surface of the sea.

In one example of a single tethered floating balloon the balloon is contained in a fabric shroud provided with stabilizing fins so that the whole assembly, when tethered to the ground by a rope will be maintained at a substantially constant altitude and attitude irrespective of the wind speed.

Another example of a single balloon is enclosed in a substantially non-extensible plastic covering the weight of the assembly being such that it will not rise into the air. This example is used for providing a radar reflector for search or other purposes floating upon the surface of the sea.

The device described has the advantage that the radio aerial, being internal, does not add to the drag of the device as a whole, and can be made lighter than one which is external.

What we claim is:

1. A device which includes an inflatable balloon having arranged within its interior a radio aerial comprising at least one non-rigid electrically conductive member which upon inflation of the balloon assumes and maintains its predetermined dimensions and disposition.

2. A device including an inflatable balloon having supported within its interior a radio aerial comprising at least one limp electrically conductive member, inflation of the balloon causing the electrically conductive member to assume and maintain the predetermined dimensions and disposition of the radio aerial.

3. A device including an inflatable balloon contained within an outer covering, and having an electrically conductive member or a system of electrically conductive members arranged within its interior whereby when the balloon is inflated the electrically conductive member or the system of electrically conductive members assumes and maintains the predetermined dimensions and disposition of a radio aerial.

4. A device including an inner inflatable balloon contained within an outer inflatable balloon, the inner balloon having an electrically conductive member or a system of electrically conductive members arranged within its interior whereby when the inner balloon is inflated the electrically conductive member or the system of electrically conductive members is caused to assume and maintain the predetermined dimensions and disposition of a radio aerial, means also being provided to maintain the inner balloon approximately at a predetermined size under varying atmospheric conditions.

5. A device as claimed in claim 4, wherein the inner balloon is provided with a gas valve to maintain a pressure differential between the inside and outside of the inner balloon when both the inner and outer balloons are inflated thereby to maintain said inner balloon approximately at predetermined size under varying atmospheric conditions.

6. A device as claimed in claim 5, wherein the gas valve on the inner balloon includes a

tube to which the outer balloon is secured.

7. A device as claimed in claim 6, wherein the tube forms a common filling nozzle for inflating both the inner and outer balloons.

8. A device as claimed in claim 6 or 7, wherein the inner and outer balloons and the tube are composed of rubber.

9. A device as claimed in claim 8, wherein the wall of the inner balloon is thicker than the wall of the outer balloon.

10. A device as claimed in claim 6, 7 or 8 wherein the tube is formed as the neck of the inner balloon.

11. A device as claimed in any of the preceding claims, wherein the balloon within which the electrically conductive member is arranged is provided with a gas valve comprising at least one hole in said balloon covered with resilient material so as normally to form a gas-tight seal over said hole, said resilient material being arranged to be acted upon by means in response to variations in size of the balloon thereby to unseal the hole.

12. A device as claimed in claim 11, wherein the gas valve comprises two diametrically opposite holes in a tube attached to said balloon, the holes being covered by a sleeve of resilient material.

13. A device as claimed in claim 11 or claim 12, wherein the resilient material is mechanically coupled to a part of the balloon whereby upon expansion of said balloon under atmospheric conditions the resilient material is moved away from the hole thereby to unseal it.

14. A device as claimed in claim 13, wherein the mechanical coupling comprises a tape, one end of which is connected to the resilient material in the vicinity of the hole the other end being connected to a part of the balloon.

15. A device as claimed in any preceding claim wherein the balloon within which the electrically conductive member is arranged, has a parachute attached to its outside.

16. A device as claimed in claim 15, wherein the parachute is arranged, in its inoperative condition, to fit closely upon part of the surface of said balloon.

17. A device as claimed in claims 14 and 15 wherein the tapes, with others, form the shroud lines of the parachute.

18. A device as claimed in any preceding claim, wherein the electrically conductive member is arranged to form a corner reflector for electromagnetic signals.

19. A device as claimed in any preceding claim, wherein the electrically conductive member is of metallised open-mesh material.

20. A device as claimed in claim 19, wherein the material is nylon.

21. An aerial device substantially as described with reference to the accompanying drawing.

WITHERS & SPOONER,
Chartered Patent Agents,
For the Applicants.

PROVISIONAL SPECIFICATION

Improvements in and relating to Devices including an Inflatable Balloon.

We, SUCAL LIMITED, a British Company of 62-64, Temple Chambers, Temple Avenue, London, E.C.4, and CHARLES THEODOR SUCHY, a British subject of "Austerlands," Kingston Hill, Kingston, Surrey, and DAVID JOHN MCAULEY, a British subject of 20 Upper Park Road, London, N.W.3, and HAYDN JOHN FERRER, a British subject of 2A Halsbury Road East, Northolt Park, in the County of Middlesex, do hereby declare this invention to be described in the following statement:—

This invention relates to devices including an inflatable balloon.

In accordance with the invention there is provided a device including an inner inflatable balloon, and an outer inflatable balloon, and a gas valve controlling the passage of gas from space within the inner balloon to the space between the two balloons. The gas valve can be arranged to maintain a pressure differential between the inside and outside of the inner balloon which is constant, or approximately so, so that the inner balloon will be maintained at constant size.

Other features and advantages of the invention will be apparent from the following description, given by way of example, of one embodiment thereof.

In this embodiment there is provided a balloon assembly including a radar reflector, which is adapted to be inflated and released for free flight, to be tracked by a radar apparatus for meteorological purposes. This assembly includes an outer balloon of thin rubber or the like, and similar to that normally used for this purpose, and an inner balloon, also inflatable, but of somewhat thicker material. Within the inner balloon is secured a radar "corner" reflector; the reflector is formed of thin metallised fabric, such as open-mesh nylon material metallised by the process of British patent No. 572,071. The reflector has six apices, at which it is secured to the inner surface of the inner balloon, so that when the balloon is inflated to the correct size the reflector presents eight reflecting "corners."

For satisfactory operation as a reflector, the reflector has to be made of material which is only very slightly and preferably negligibly extensible; if the inner balloon were caused

to expand very much beyond the optimum size for supporting the reflector, as would be the case if the inner balloon were allowed to ascend freely, it would be seriously distorted and would rapidly burst.

To prevent this, means are provided for controlling the pressure differential on the skin of the inner balloon. While a variety of means can be used for this purpose, a valve which has been found satisfactory is formed by means of a hard rubber or like tube, constituting the neck of the inner balloon and having in it two holes covered by a rubber sleeve fitting on the tube. The elasticity of the sleeve is normally sufficient to keep the holes covered against the pressure within the balloon. Two tapes or the like are attached to points on the surface of the balloon, at approximately opposed points on the horizontal mid-plane of the balloon (the neck being considered lowermost) and these tapes are attached to the rubber sleeve, near the holes over which the sleeve lies. In this way, when the inner balloon expands the tapes pull the sleeve away from the holes and permit gas to pass from within the inner balloon to the space between the balloons.

The neck of the outer balloon can be secured to the outside of the same hard rubber tube, below the valve formed therein. The tube can then form a common filling nozzle for both balloons.

If desired a parachute can be attached to the outside of the inner balloon, to prevent the parts, after both balloons have burst, from falling too rapidly and possibly causing injury. In this case the parachute may fit closely upon the upper half of the inner balloon, and the tapes, with others, can form the shroud lines of the parachute.

The device described has the advantage that the reflector, being internal, does not add to the drag of the device as a whole, and can be made lighter than can the ordinary braced reflector.

WITHERS & SPOONER,
Chartered Patent Agents,
For the Applicants.

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758,090 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

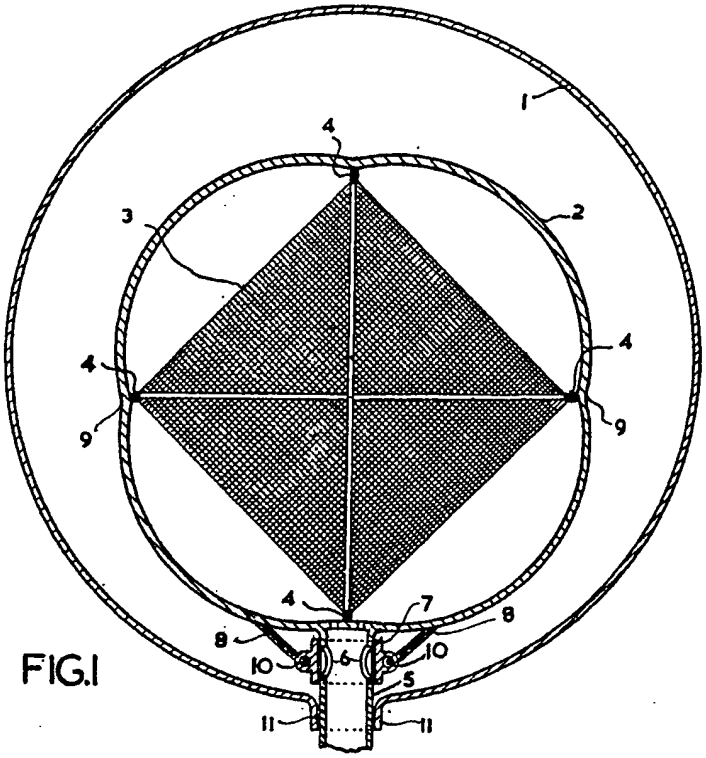

FIG.1

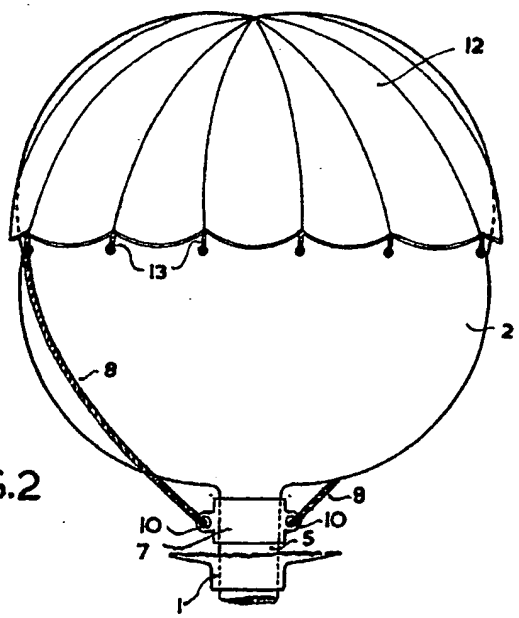

FIG.2